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Research Question

How do patients and family caregivers perceive and negotiate the trade-offs between emotional support and privacy when interacting with humanoid assistive robots in care settings?

Negotiating Emotional Support and Privacy with Humanoid Assistive Robots in Care Facilities

In this research, we aim to understand how humanoid robots will shape emotional care, privacy, and trust in care facilities such as hospitals, rehabilitation centers, and long term elderly homes. Our main research question is: How do patients and family caregivers perceive and negotiate the trade-offs between emotional support and privacy when interacting with humanoid assistive robots in care settings? We focus on three intersecting themes, relying on HCI/HRI literature and on academic discussions on robots: **Emotional Interaction**, **Privacy, Safety, and Ethical Concerns**, and **Trust and Boundaries**.

Section 1. Emotional Interaction

Key takeaway

Emotional interaction plays a major part in how patients and caregivers perceive humanoid assistive robots in care settings. Research shows that robots with emotional expressiveness through facial expressions, vocal tone, gestures, or empathic dialogue tend to increase users' comfort, engagement, and willingness to interact. For example, Abdollahi et al. (2022) demonstrated that older adults interacting with the "Ryan" engaged more deeply and reported stronger emotional support when the robot used tailored emotional cues than when interacting with a non-empathic version. However, some users are wary of emotional displays that feel superficial or inconsistent. Altogether, this work suggests that emotional expressiveness can be very beneficial, but only when its design is aligned with users' expectations and the robot's actual capabilities.

Aspect 1: Emotional Expression and Anthropomorphic Cues

A key aspect of emotional interaction involves how signals such as facial expressions and anthropomorphic features shape user perceptions. Cameron et al. (2018) demonstrated that robots with clearly readable facial expressions and coordinated movements were rated as

significantly warmer, more empathic, and more trustworthy by participants. These findings are consistent with broader HRI research showing that even minimal anthropomorphic cues, such as eye gaze or nodding, can lead users to perceive the robot as emotionally intelligent (Kory-Westlund & Breazeal, 2019). However, the literature also indicates that emotional cues can have unintended effects. When a robot's affective displays suggest competence or understanding that the underlying system cannot deliver, users may describe the robot as inauthentic or pretending (Kim et al., 2021). This mismatch reduces comfort and trust, highlighting the importance of aligning emotional design with the robot's actual capabilities.

Aspect 2: Self-Disclosure and Companionship

Another important takeaway is how emotional interaction influences self-disclosure and companionship. Read et al. (2022) found that informal caregivers began sharing more personal feelings with a social robot over repeated sessions because they perceived it as non-judgmental and consistently attentive. Similar findings appear in studies of older adults who use companion robots, showing that emotional expressiveness can reduce loneliness and encourage therapeutic reflection (Abdollahi et al., 2022). However, several scholars emphasize limits to robot-mediated emotional support. Coghlan et al. (2021) argue that emotionally responsive robots risk creating a false illusion of mutuality, potentially leading to over-reliance or emotional dependency if users believe the robot cares more deeply than it does. These concerns emphasize that humanoid assistive robots should be designed to enhance human well-being while preserving real human connections and avoiding any misrepresentation of the robot's true emotional abilities.

Section 2. Privacy, Safety, and Ethical Concern

Key takeaway

While humanoid care robots offer the promise of personalized and more seamless care, they also function like mobile sensor networks that extend even into the most intimate care areas. In these settings, humanoid robots transform privacy not only at the level of "data confidentiality" but also across physical, emotional, and relational dimensions (Cardiell, 2021). Because of this reason, patients and families will have to evaluate these robots not only from the beneficial and supportive point of view, but also from the aspect of what they are recording, who is accessing these data and how this data will be used. Emotional support, data privacy and bodily autonomy become very entangled with institutional power dynamics in such cases.

Aspect 1: Data Collection in Intimate Spaces

Humanoid robots used in care environments emerge as a novel use of technology that also transforms privacy in many dimensions. The literature on social robots in elderly care emphasizes that these systems reduce isolation (Abdi et al., 2018). But concerns about privacy, with questions such as "is every moment of my life being recorded?", have become central to

the privacy experience. Most of the users wouldn’t know which data is being recorded and for how long, how they are kept and whom this data is shared with. This ambiguity could result in users shutting down the device, moving it away from the bedroom or avoiding interactions with the robot altogether. According to Norman (2013), feedback is essential for confident interaction; in this context, real-time feedback about sensor activation can help users calibrate trust and maintain a sense of control. Experimental studies show that users feel most secure when it is clearly apparent that the robot's sensors are turned off (for example, when the robot closes its eyes or turns its back, reinforcing the feeling of “I am not being watched”) (Nieto Agraz et al., 2025). For robots to be accepted socially, their data collection processes should be transparent and customizable.

Aspect 2: Perceived Safety and Emotional Risk

Privacy concerns affect emotional safety as much as they do physical safety. Robots function not just as assistants but also as platforms that continuously collect data on users' bodies and behaviors, potentially making individuals feel like objects that are "constantly measured and managed" (Minds, 2024). When a robot encourages a patient to talk about depression or pain, the user can think of who else will hear about this discussion. People are more cautious when they suspect their emotional disclosures may be judged or used against them. For example, while 1X Technologies' NEO robot performs autonomous tasks, it allows operators to monitor the user's living space in real time during complex situations. This increases the sense of surveillance despite measures such as face blurring (Mogg, 2025). Moreover, as it can be observed in the case of the Unitree G1, security vulnerabilities that allow third parties to access cameras and microphones (Markovic, 2025) create cybersecurity risks by turning these devices into potential spying tools. Patients may fear that their emotional disclosures about depression or pain could be stolen or used for malicious purposes. That’s why, there should be clear rules around robots having “off the records” settings or limited access modes.

Aspect 3: Ethical Debates on Dignity, Autonomy, and Substitution of Human Care

Care robots without a doubt would transform the care experience for patients individually, but they could also shape the complex relationship between the patient, family and the caregivers. Ethical debates define “care” not merely as the completion of tasks, but as a form of relationship involving vulnerability, reciprocity, and moral responsibility (Van Wynsberghe, 2013). In this regard, robots can have a transformative role in care, as they can facilitate in-family video calls, assist patients in practicing speech or act like interlocutors in “tense” moments. However, excessive intervention could also overshadow human-to-human communication. For instance, a robot providing reminders or collecting feedback could hinder the natural conversations between the family members. Because of this reason, when to disengage the robot is an important design question. Giving patients or users the control such as the ability to decide where data is stored or to provide dynamic consent, significantly reduces concerns about lost autonomy (Nieto Agraz et al., 2025). The literature also suggests positioning robots as complementary tools that lighten the load on nurses rather than replacing the core of relational care.

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Section 3. Trust and Boundaries

Key takeaway

Trust in assistive humanoid robots is not automatic, it would be calibrated with time, performance and transparency. In care facilities, patients and their families are already entangled with a complex system composed of doctors, nurses and administrators. In this environment, robots become another factor whose reliability, motivations and limits need to be clearly defined and agreed upon. Research shows that trust in healthcare robots is largely dependent on transparency, explainability, and clarity in the human-robot role distribution (Townsend & Majidirad, 2022). In this setting, emotional interaction, privacy and trust cannot be separated with each other, and if the patients don't have trust in the robot or in the facility controlling it, then it is a low probability that they will use them for a meaningful emotional support.

Aspect 1: Calibrating Trust Through Performance and Transparency

HRI studies show that people tend to place excessive trust in human-like robots, even when their capabilities are limited (Aroyo et al., 2021). Studies which compare trust in autonomous humanoid robot doctors versus trust in human doctors show that trust in humans is still slightly higher. Nevertheless, this difference is decreasing, but this situation varies according to demographic characteristics (Kim, 2024).However overconfidence in human looking robots (or automation bias) is especially risky in care domains. Even the smallest mistakes could erode the confidence very quickly. Consequently, successful designs should enable the robot to both show its capabilities well and to define their limitations clearly to avoid trust problems in the future. Clear statements such as "I didn't understand, I'm calling your nurse" would strengthen the trust. Furthermore, visual cues indicating the sensor status (camera on/off) help users set boundaries, transforming them from passive observers into active decision-makers (Van Wynsberghe, 2013; Nieto Agraz et al., 2025).

Aspect 2: Establishing Boundaries and Ethical Safeguards

Another critical factor in building trust is how boundaries are communicated and respected. Patients and caregivers are sensitive to the robot's role in both emotional and practical tasks, and unclear boundaries can lead to over-reliance or unrealistic expectations (Bradwell et al., 2020). Research also shows that users often limit their interactions or selectively share information to protect privacy and maintain autonomy (Ullman & Malle, 2017). Implementing ethical safeguards, such as clearly defined roles for the robot, transparency about data collection, and user control over interaction frequency, helps users feel safe and confident in the system (Beer et al., 2025). By designing robots with clear boundaries, they can support users effectively without taking the place of human caregivers or giving the impression that the robot truly feels emotions, helping maintain trust and responsible use.

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Section 4. Future Research Opportunities

Existing HRI research has relied heavily on lab studies or short-term prototype testing, often emphasizing technical performance or focusing on a single user group. Much less is known about how robots are integrated into the daily routines of real care facilities, leaving a gap in understanding how patients, family caregivers, and staff negotiate boundaries and “rules” for robots over time. Our research questions build on this gap by examining these trade-offs directly in care settings and identifying which design features shape how people evaluate and manage tensions between emotional support and privacy.

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